NEW HORIZONS IN SOIL SCIENCE

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Subsurface Drains: Principals and Practice [1/]

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Rural land drainage in Wisconsin has a history as long as Wisconsin agriculture. Proper soil moisture conditions are a primary component for optimal crop growth. Sub-surface drains are one method commonly used in agricultural systems to remove excess water from the soil profile. Excess water removal allows air-flow into soil voids in turn supporting, soil biotic processes, improving root development, nutrient retention, and field equipment accessibility. Subsurface drainage is most often accomplished using buried tubing or tile at a specified spacing and depth. Historically, drain tiles were made from a range of materials that included wood, clay and concrete, clay and concrete being the most common. Field laterals consisted of individual pipe sections typically 12 inches long and 4 inches in diameter, laid in a hand-dug trench, end-to-end with a 1/8-inch gap between tiles for water entry. Grade hubs (stakes) and string lines were surveyed in the field and used to establish line slope and route. Tile line installation has evolved from the tile spade through mechanical equipment, such as the Buck Eye Wheel Trencher, the ladder trencher to the automated tile plow. Adjustable grade lasers are now the tool of choice to set tile grade. The greatest evolution in tile material came from Europe in the 1970s with the introduction of plastic drain tubing, which is still the material of choice. Both accuracy and installation efficiency have increased significantly over the past 50 years.

Sub-surface tile drainage has a number of benefits that include: increased crop yields, improved field trafficability, greater soil water storage capacity, and reduced topsoil loss and soil warm-up time in the spring. However, along with these benefits come environmental risks such as the increased potential for nutrient and pesticide export through surface inlets and macropores

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and the conveyance field applied liquid manure directly to receiving waters via tiles. In addition, wetland drainage is prohibited by law and landowners will be held responsible if wetlands are drained. Some methods to manage manure export risk include: controlling liquid manure solids content, using tile plugs or shut-offs during injection, modifying tillage operations to disrupt macropores and using precision farming methods to avoid tiled areas. Converting tile surface inlets to a sub-surface inlet system can both reduce environmental risk and increase ease of operation for the producer. Preliminary design standards for a sub-surface pot-hole inlet have been developed by Iowa NRCS and several systems have been installed. To date, no formal evaluation of this design has been completed; however, to date no problems have been reported.

Changes to any drainage system require field locating existing tile lines. When new tile are installed GPS coordinates should be collected for the entire tile system; however, many existing tiles were installed many years ago and their location long since forgotten. There are several methods that may help locate tile in the field tile. These include looking for variations in soil moisture in air photos taken during spring (just after frost-out) as well as looking for differences in crop growth or health. Typically these differences will follow a regular pattern that aligns with tile laterals. In addition, crop yield maps may be used to identify lateral locations if regular variations are noted in crop yields. Once tiles have been located, their location should be recorded for future reference. Should it be necessary to conduct repairs or modifications to a drainage system, there are a number of agencies that may have regulatory authority over a tile construction project. These agencies include: USDA-NRCS, Wis. DNR, the Corps of Engineers, the county and the local drainage board. Before starting tile system construction, it is important to check with the appropriate regulatory authorities and your local NRCS field office. Making tile system changes in violation of Farm Bill regulations could result in forfeiture of Farm Bill Program eligibility or enforcement action by a regulatory agency.